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Assumptions

- VIDEO – Three Options

High Quality	Medium Quality	Lower Quality
500 kbps	**400 kbps**	**256 kbps**

- AUDIO – Three Options

High Quality	Medium Quality	Lower Quality
32 kbps	**24 kbps**	**16 kbps**

- CODING – Two Options

SCCC Outer Code	SCCC Outer Code
1/4, 1/4, 1/4, 1/4	1/2, 1/4, 1/4, 1/4
Efficiency = 17.1%	**Efficiency = 26.4%**

- Notes:
  - A range of 0 to 200 kbps is reserved for overhead (ESG, null bits, etc.), this value has been adjusted to try to optimize scenarios
  - The bit rate of still images is negligible for purposes of this document
  - NRT and other data delivery via M/H is not considered in this document
  - Refer to ATSC A/153 Section 2 Chart 6.1 for complete details

Case 1 - One max-quality program

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One max-quality program - 1/2, 1/4, 1/4, 1/4

Video bit rate	768 kbps
Audio bitrate	24 kbps
Overhead	176 kbps
Total MH bandwidth	3.668 Mbps
Remaining Legacy DTV Bandwidth	15.722 Mbps

One max-quality program - 1/4, 1/4, 1/4, 1/4

Video bit rate	768 kbps
Audio bitrate	24 kbps
Overhead	148 kbps
Total MH bandwidth	5.502 Mbps
Remaining Legacy DTV Bandwidth	13.888 Mbps

Case 2 - One mid-quality program

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One mid-quality program - 1/2, 1/4, 1/4, 1/4

Video bit rate	400 kbps
Audio bitrate	24 kbps
Overhead	60 kbps
Total MH bandwidth	1.834 Mbps
Remaining Legacy DTV Bandwidth	17.556 Mbps

One mid-quality program - 1/4, 1/4, 1/4, 1/4

Video bit rate	400 kbps
Audio bitrate	24 kbps
Overhead	46 kbps
Total MH bandwidth	2.751 Mbps
Remaining Legacy DTV Bandwidth	16.639 Mbps

Case 3 - Two mid-quality programs

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Two mid-quality programs - 1/2, 1/4, 1/4, 1/4

Video bit rate	800 kbps
Audio bitrate	48 kbps
Overhead	120 kbps
Total MH bandwidth	3.668 Mbps
Remaining Legacy DTV Bandwidth	15.722 Mbps

Two mid-quality programs - 1/4, 1/4, 1/4, 1/4

Video bit rate	800 kbps
Audio bitrate	48 kbps
Overhead	92 kbps
Total MH bandwidth	5.502 Mbps
Remaining Legacy DTV Bandwidth	13.888 Mbps

Case 4 - Two high-quality programs

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Two high-quality programs - 1/2, 1/4, 1/4, 1/4

Video bit rate	1100	kbps
Audio bitrate	48	kbps
Overhead	62	kbps
Total MH bandwidth	4.585	Mbps
Remaining Legacy DTV Bandwidth	14.805	Mbps

Two high-quality programs - 1/4, 1/4, 1/4, 1/4

Video bit rate	1100	kbps
Audio bitrate	48	kbps
Overhead	106	kbps
Total MH bandwidth	7.336	Mbps
Remaining Legacy DTV Bandwidth	12.054	Mbps

Case 5 - Four mid-quality programs

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Four mid-quality programs - 1/2, 1/4, 1/4, 1/4

Video bit rate	1600 kbps
Audio bitrate	96 kbps
Overhead	240 kbps
Total MH bandwidth	7.336 Mbps
Remaining Legacy DTV Bandwidth	12.054 Mbps

Four mid-quality programs - 1/4, 1/4, 1/4, 1/4

Video bit rate	1600 kbps
Audio bitrate	96 kbps
Overhead	185 kbps
Total MH bandwidth	11.004 Mbps
Remaining Legacy DTV Bandwidth	8.386 Mbps

Case 6 - Two mid-quality and one high-quality programs

Two mid-quality and one high-quality programs - 1/2, 1/4, 1/4, 1/4

Video bit rate	1350	kbps
Audio bitrate	72	kbps
Overhead	30	kbps
Total MH bandwidth	5.502	Mbps
Remaining Legacy DTV Bandwidth	13.888	Mbps

Two mid-quality and one high-quality programs - 1/4, 1/4, 1/4, 1/4

Video bit rate	1350	kbps
Audio bitrate	72	kbps
Overhead	146	kbps
Total MH bandwidth	9.17	Mbps
Remaining Legacy DTV Bandwidth	10.22	Mbps

Case 7- High number of medium quality audio services

Reasonable upper limit of medium-quality audio services - 1/2, 1/4, 1/4, 1/4 = 155

Audio bitrate of audio services (32 kbps)	3720	kbps
Overhead	153	kbps
Total MH bandwidth	14.672	Mbps
Remaining Legacy DTV Bandwidth	4.718	Mbps

Reasonable upper limit of medium-quality audio services - 1/4, 1/4, 1/4, 1/4 = 98

Audio bitrate of audio services (32 kbps)	2352	kbps
Overhead	156	kbps
Total MH bandwidth	14.672	Mbps
Remaining Legacy DTV Bandwidth	4.718	Mbps